REMARKS

Claims 1-48 are pending. Claim 48 has been amended. Support for the amendment can be found throughout the specification, for example, at page 11, line 9 to page 12, line 7. Claims 49-50 have been cancelled. No new matter has been added. Claims 1-48 are pending. Claims 1, 15, 24, 32, 43, 45, and 48 are independent

Rejections under 35 U.S.C. § 103 (a)

Claims 1-31 and 48

Claims 1-31 and 48 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent Publication 2002/0006153 to Ranson *et al.* ("Ranson") in view of U.S. Patent No. 6,322,901 to Bawendi *et al.* and U.S. Patent 5,986,272 to Britton, Jr. *et al.* See pages 2-4 of the Office Action. Claims 1, 15, 24 and 48 are independent.

Independent claims 1 and 48 and claims dependent therefrom

Applicants have discovered a method of sensing temperature including determining the temperature of a surface of a substrate from the emission intensity of light from the sensor. See independent claims 1 and 48.

The Examiner alleges that Ranson discloses a method of sensing temperature having the step of "determining the temperature from the emission of light from the sensor (page 1, paragraph 9)." Page 3 of the Office Action. However, page 1, paragraph 9 does not stand teach this. Instead, this passage of Ranson merely states "[a]ccording to the present invention there is provided a method of phosphor thermography temperature measurement comprising the steps of:...." Ranson goes on to describe "measuring and recording the intensity of said luminescence over a period of time; [and] correlating the measured variation of the intensity of the said luminescence over time to obtain a temperature measurement." Page 1, paragraphs 11-12 of Ranson, emphasis added. Ranson does not describe or suggest **determining the temperature of a surface of a substrate from the emission intensity of light from the sensor**. Indeed, Ranson relies on the decay characteristics of emission to determine the temperature (see page 2, column 2, lines 2-5, Figure 4, and page 3, column 1, lines 5-8 of Ranson), not the actual emission

intensity to determine the temperature as in independent claims 1 and 48. The method of Ranson and of claims 1 and 48 are physically distinct.

Moreover, Ranson does not provide any motivation to determine the temperature of a surface of a substrate from the emission intensity of light from the sensor. The only emission properties that are recognized to be associated with temperature in Ranson are decay and rise time. See page 3, lines 7 and 21 of Ranson.

Bawendi and Britton do not describe or suggest determining the temperature of a surface of a substrate from the emission intensity of light from the sensor. Indeed, Bawendi discusses how to prepare and manipulate semiconductor nanocrystals. See Bawendi at Abstract. Like Ranson, Britton discloses determination of decay time constants of fluorescing phosphors and using the decay time constants to determine temperatures. See Britton at column 2, lines 12-18. Thus, Ranson combined with Bawendi and Britton does not render claims 1 and 48 obvious.

Moreover, there is no motivation to combine the teachings of Ranson with those of Bawendi. There is no suggestion or motivation in Ranson to use any materials other than a thin film of a phosphor material in a method of temperature measurement. There is also no suggestion or motivation in Britton to use any material other than a phosphor material in a method of temperature measurement. And, in Bawendi, there is no suggestion or motivation to use a semiconductor nanocrystal in a method of temperature measurement. Thus, without the benefit of Applicants' discovery, a person of ordinary skill in the art would not have been motivated to use the semiconductor nanocrystals of Bawendi in a method of temperature measurement.

For at least these reasons claims 1 and 48 and the claims that depend therefrom are patentable over Ranson combined with Bawendi and Britton. Applicants respectfully request reconsideration and withdrawal of this rejection.

Independent claims 15 and 24 and claims dependent therefrom

Applicants have also discovered a temperature sensor and a temperature sensing coating including a matrix containing a semiconductor nanocrystal, the matrix formed from a semiconductor nanocrystal and a binder. See independent claims 15 and 24.

The Examiner alleges that "it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the temperature sensor disclosed by Ranson by replacing the luminescent element with the luminescent element disclosed by Bawendi, since Britton teaches that fluorescent phosphors are thermographic phosphors, and these elements are therefore alternate types of thermographic phosphors that can be used to determine temperature." See page 4 of the Office Action.

Ranson teaches using a "thin film phosphor coating **10** of Europium doped Yttrium Oxide". See page 3, paragraph 36, lines 2-3 of Ranson. There is no teaching or suggestion in Ranson of a temperature sensing coating including a matrix containing a semiconductor nanocrystal, the matrix formed from a semiconductor nanocrystal and a binder. Indeed, Ranson does not describe or suggest a binder. Neither does Britton. Britton teaches using "yttrium vanadate doped with europium" as the "phosphor sample". See column 3, lines 62-63 of Britton. Britton does not describe or suggest a binder. Thus, neither Britton nor Ranson describe, suggest a matrix formed from a semiconductor nanocrystal and a binder. Bawendi also does not describe or suggest a binder. Accordingly, a *prima facie* case of obviousness has not been presented, and the obviousness rejection of claims 15 and 34, and dependent claims, over combinations of Ranson, Britton and Bawendi should be withdrawn.

Moreover, the Examiner has failed to provide the required motivation for combining the references and is using improper hindsight to reconstruct the applicants discovery. There is no suggestion in Ranson, Britton, or Bawendi to use semiconductor nanocrystals as a temperature sensor or in a temperature sensing coating including a binder. Ranson specifically identifies Europium doped Yttrium oxide, Dysprosium or Terbium doped Yttrium Aluminium Garnet, and Europium doped Lutetium Phosphate as appropriate phosphors in its coatings for determining temperature. See page 4, paragraph 44 of Ranson. Britton discloses a method for determining

the temperature of a fluorescing phosphor using time decay constants and a specific apparatus. See Abstract of Britton. Neither Ranson nor Britton provide motivation to use semiconductor nanocrystals as temperature sensors or in a temperature sensing coating or to form a coating using semiconductor nanocrystals or to form a coating for temperature measurement including a binder. Bawendi also does not provide the necessary motivation. Bawendi discusses production and some properties of semiconductor nanocrystals. See Abstract of Bawendi. Bawendi does not suggest or provide motivation to use semiconductor nanocrystals and a binder as temperature sensors or in a temperature sensing coating.

The Examiner asserts that:

> [T]he references teach that a thermographic phosphor is used as a luminescent element for determining the temperature of a surface (Ranson), and that a semiconductor nanocrystal in a binder functions as a fluorescent phosphor (Bawendi) which are known to be thermographic phosphors. Therefore it would have been obvious to utilize a semiconductor nanocrystal in a binder as a luminescent element for determining the temperature of a surface (page 9 of the Office Action).

Applicants respectfully disagree. Importantly, nowhere in any of these references is there a motivation to use semiconductor nanocrystals as temperature sensors or in a temperature sensing coating. Furthermore, there is no suggestion or teaching that semiconductor nanocrystals can be used as such. Finally, at the very best, the Examiner's assertion is an assertion that it would be obvious to try using semiconductor nanocrystals as temperature sensors or in a temperature sensing coating. However, for at least the reasons outlined above, a person of ordinary skill in the art would not have been motivated to do so. Again, the Examiner is relying on improper hindsight to reconstruct Applicants' discovery.

The Examiner's expression of the state of the law for combining references and hindsight is incorrect. The Examiner states:

> [I]t must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary interest at the time the invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper (Page 9 of the Office Action).

However, this is not the standard the Examiner has applied here. Applicants' specification has been used as a kind of blueprint that is constructed from individual pieces of prior art to render the claim obvious. See Interconnect Planning Corp.v. Feil, 774 F.2d 1132 (Fed. Cir. 1985) ("It is error to reconstruct the patentee's claimed invention from the prior art by using the patentee's claim as a "blueprint". When prior art references require selective combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight obtained from the invention itself."); In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999)("Our case law makes clear that the best defense against the subtle but powerful attraction of hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."). The law currently requires the prior art to include a motivation, teaching, or suggestion to combine. The prior art cited by the Examiner does not provide the requisite motivation teaching or suggestion.

For at least these reasons, claims 15 and 24 and the claims that depend therefrom are patentable over each of Ranson, Bawendi, and Britton and combinations thereof. Applicants respectfully request reconsideration and withdrawal of this rejection.

Claims 32, 33, and 37-47

Claims 32, 33 and 37-47 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,075,493 to Wickersheim ("Wickersheim") in view of Bawendi, Britton, and U.S. Patent No. 5,233,020 to Hase *et al.* ("Hase"). Page 4 of the Office Action. Claims 32, 43 and 45 are independent.

Applicants have described a temperature sensing paint including a semiconductor nanocrystal in a binder and a deposition solvent. See independent claim 32. Applicants have discovered a method of manufacturing a temperature sensing paint that includes combining a semiconductor nanocrystal, a binder, and a deposition solvent. See independent claim 43. Applicants have also discovered a method of manufacturing a temperature sensor that includes depositing a temperature-sensing paint on a surface of a substrate where the temperature-sensing

paint includes a semiconductor nanocrystal in a binder and a deposition solvent. See independent claim 45.

The Examiner asserts that the combination of references teaches:

> [T]hat a thermographic phosphor is used as a luminescent element in a temperature sensitive paint for determining the temperature of a surface (Wickersheim), that a semiconductor nanocrystal in a binder functions as a fluorescent phosphor (Bawendi) which are known to be thermographic phosphors (Britton), and that a solvent is an ingredient commonly used to create paint (Hase). Therefore it would be obvious to utilize a semiconductor nanocrystal in a binder as a luminescent element in a temperature-sensitive paint to determine the temperature of a surface (Page 11 of the Office Action).

Applicants respectfully disagree. None of Wickersheim, Bawendi, Britton or Hase describe or suggest a paint including a semiconductor nanocrystal in a binder and a deposition solvent, or provide any motivation to do so. Accordingly, a *prima facie* case of obviousness has not been presented and this rejection should respectfully be reconsidered and withdrawn.

Wickersheim discusses a technique of optical temperature measurement where the object of interest is given a coating of phosphor containing material that emits at least two optically isolatable wavelength ranges. See Abstract of Wickersheim. Wickersheim does not suggest or provide motivation to use semiconductor nanocrystals in a temperature sensitive paint. Bawendi discusses production and some properties of semiconductor nanocrystals. See Abstract of Bawendi. Bawendi does not suggest or provide motivation to use semiconductor nanocrystals in temperature sensing paint. Britton discloses a method for determining the temperature of a fluorescing phosphor using time decay constants and a specific apparatus. See Abstract of Britton. Britton does not provide motivation to use semiconductor nanocrystals in temperature sensing paint, or to form a paint for temperature measurement. Hase discloses paint binders. See Abstract of Hase. Hase does not provide motivation for using semiconductor nanocrystals in a temperature sensitive paint. None of the cited references alone or in combination provide motivation to use semiconductor nanocrystals in a temperature-sensitive paint. None of the cited references provide motivation or teaching to combine with one another.

With respect to claims 43 and 45, the Examiner asserts that "in manufacturing the paint disclosed by Wickersheim, Bawendi, Britton and Hase, the method steps of claims 43-47 will inherently be followed." See page 6 of the Office Action. As discussed previously, Wickersheim, Bawendi, Britton and Hase and combinations thereof do not disclose using semiconductor nanocrystals in temperature sensing paints or as temperature sensors. There is no indication in any of these references that semiconductor nanocrystals can be used in temperature-sensing paint or as temperature sensors, or applied as a paint. Thus, a method of manufacturing such a paint or sensor cannot be inherent.

As discussed previously, the Examiner appears to be employing impermissible hindsight to reconstruct Applicant's discovery using the patent as a template. Furthermore, the Examiner has failed to provide the required teaching, suggestion, or motivation to combine the references. Nowhere in any of the cited references is there a motivation to use semiconductor nanocrystals in temperature sensitive paints. In addition, there is no suggestion or teaching that semiconductor nanocrystals can be used as such. The Examiner appears to be using impermissible hindsight to reconstruct the features of Applicants claims by taking random pieces of the prior art and combining them, without identifying a teaching, suggestion or motivation to do so.

For at least these reasons, claims 32, 45 and 47 and the claims dependent therefrom are patentable over Wickersheim, Bawendi, Britton, and Hase and the combination thereof. Applicants respectfully request reconsideration and withdrawal of this rejection.

<u>Claims 34-36</u>

Claims 34-36 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Wickersheim, Bawendi, Britton, Hase, as applied to claims 32, 33, and 37-47 above, and further in view of the prior art disclosed by the Applicants ("Prior Art"). See Office Action at page 7. Claims 34-36 depend from independent claim 32.

Applicants have described a temperature sensitive paint that includes a semiconductor nanocrystal in a binder and a deposition solvent. See independent claim 32.

As discussed previously for claims 32, 43and 45 Wickersheim, Bawendi, Britton, and Hase, none of these references provides a motivation to combine with the others, and none of them provides using semiconductor nanocrystals in a binder and a deposition solvent for use in a temperature sensing paint or that semiconductor nanocrystals can be used in a temperature sensing paint. The Prior Art mentioned by the Examiner fails to cure this deficiency. The Examiner claims to not even be using the Prior Art for this purpose, but rather for the purpose of teaching that temperature-sensing compositions can be used in combination with pressure-sensing compositions that include a platinum porphyrin. As a result, the Examiner has failed to establish a *prima facie* case for obviousness.

For at least these reasons claims 34-36 are patentable over Wickersheim, Bawendi, Britton, Has, and the Prior Art. Applicant respectfully requests reconsideration and withdrawal of this rejection.

CONCLUSION

Applicants request that all claims be allowed. Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: 11-24-03

Harold H. Fox
Reg. No. 41,498

Fish & Richardson P.C.
1425 K Street, N.W.
11th Floor
Washington, DC 20005-3500
Telephone: (202) 783-5070
Facsimile: (202) 783-2331

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